

is ordinarily detoxicated, but which are not detoxicated by the tissues on the second injection of serum owing to the previous injection having exhausted this hypothetical detoxicating substance. From experiments, details of which will appear later, it appears that the normal human being, as well as the cat and dog, have the power of detoxicating not only betaimidazolethylamin but also the other toxic amins formed by intestinal putrefaction, while the asthmatic individual has apparently lost this power.

We are accustomed to notice urticaria as evidence of intestinal toxemia, while the eosinophilia in asthma and anaphylaxis are frequent accompaniments of intestinal toxemia.

In my paper before the Louisiana State Medical Society in 1909, already referred to, I stated: "The fact that I have found evidence of auto-intoxication in every case of asthma examined by me for four years, leads me to believe that during the attack there is some toxin in the blood which acts similarly to the muscarin, or which depresses the respiratory centre to such an extent that the reflex stimulation of an inflamed nasal mucosa results in stimulation of the constrictor fibers of the vagus."

I now submit the above facts as bearing out, in part, my original contention, which I hope to be able to prove definitely in a short time by the isolation of this specific amin from the blood of asthmatics.

In closing, I wish to thank Dr. Maurice Couret, of the pathological department of Tulane University, for his kindness in taking the accompanying photographs.

**A RECURRENT DISEASE OF THE SKIN ASSOCIATED WITH
HIGH WINDS AND COLD WEATHER, FOR WHICH
THE NAME DERMATITIS HIEMALIS HAS
BEEN PROPOSED.**

BY WILLIAM THOMAS CORLETT, M.D., L.R.C.P. (LOND.),

PROFESSOR OF DERMATOLOGY AND SYPHILOLOGY, WESTERN RESERVE UNIVERSITY,

AND

HAROLD NEWTON COLE, Ph.B., M.D.,

HANNA RESEARCH FELLOW IN PATHOLOGY, WESTERN RESERVE UNIVERSITY.

(From the Dermatological Clinic of the Lakeside Hospital, and the Pathological Laboratory of Western Reserve University.)

THE skin from its exposed condition is more influenced by extraneous conditions, such as climate, etc., than are other organs of the body. Many diseases of the skin are limited to certain

equatorial zones and others are greatly modified by climatic influences.

In 1874 Duhring¹ called attention to a pruritus, common in winter in certain regions of North America, which he called prurigo hiemalis. Hutchinson² and Hyde³ have also emphasized the influence of climate in certain dermatoses.

The condition herein described first attracted attention in 1883, since which time many cases have presented themselves for observation and study.

A report on the syndrome as observed in 14 cases was read before the International Medical Congress in Rome, in 1894, by one of the present writers, and later in the year it was presented before the American Dermatological Association. In 1896 a second report was read before the International Dermatological Congress in London. Again, in 1902, a more complete investigation of the condition was made, 9 additional cases being reported and carefully studied, both macroscopically and microscopically, especially in regard to the possible parasitic causation of the disease, as well as the relation it bears to an ordinary eczema.

These studies may be summarized as follows: Dermatitis hiemalis is a cutaneous eruption having definite clinical symptoms, following a fairly uniform course, and always associated with or limited to cold weather. It resembles eczema in that there is an inflammation, watery exudation, and some itching. Unlike eczema, however, it more frequently is accompanied by smarting, burning, and tingling. It disappears during the summer months and reappears the following autumn. The seat of predilection is the back of the hands, wrists, and more rarely the fingers; very rarely the feet, and never the trunk, arms, or thighs. Again, unlike eczema, the lesions are circumscribed, well defined, often with elevated edges, with a tendency to heal in the centre. All symptoms are aggravated by atmospheric changes, especially by storms and sudden variation of temperature. The lesions are very resistant to treatment, although they disappear spontaneously at the approach of summer or when the patient goes southward away from the lake region. Occupation or sex appear to have little to do with the condition. Careful examination for saprophytic organisms has invariably given negative results. From clinical studies the affection appears to be more closely allied to some of the erythemas than to eczema, and may be similar to if not identical with the condition referred to by Jonathan Hutchinson⁴ as "some peculiar eruptions allied to chilblains." Confirmatory is the suggestive bluish or purplish tint of the eruption that attacks the distal

¹ Philadelphia Med. Times, January 10, 1874.

² Clinical Lectures, London, 1879, i, 352.

³ Chicago Med. Jour. and Exam., 1885, 1, 157, and 1886, 3, 116.

⁴ Loc. cit.

extremities or parts farthest removed from the centres of circulation, and that it is met more frequently in the months in which there is the greatest variability in temperature. The histological findings are not distinctive, and the extent of the changes in the skin seems to be wholly dependent on the amount of the circulatory disturbances. This would lead one to infer that the disease is allied to eczema while characterized by some of the clinical features of chilblain. It presents, however, a distinct clinical picture which further observation may show is entitled to be looked on as a disease *sui generis*.

Since the presentation of the last paper many more cases have been observed, and we have made the following study, more especially on a few cases seen in the last two years. This work will be taken up under the following headings: (1) Etiology of the disease; (2) case histories; (3) a study of the histological findings, (4) the conditions of parakeratosis and acanthosis; (5) the course of pathological changes in the production of the disease; (6) treatment.

ETIOLOGY. At the International Medical Congress in Rome in 1894 it was questioned whether the etiological factor might not be found in one of the organisms of the *tinea* group, especially as the lesions were circumscribed and tended to heal in the centre. However, one of the writers, in conjunction with Dr. Henry S. Upson, presented a report on 4 cases before the International Dermatological Congress at London in 1896, in which it was shown that no pathogenic organisms were present. Moreover, such an etiological factor does not seem tenable, for if it were of parasitic origin it would undoubtedly affect other portions of the body and be carried from one person to another in the same family. This is not the case, for we have never seen 2 cases in the same family. Then, too, the affection is on an exposed part of the body which is very frequently cleansed, which again militates against the chance of such infection. Moreover, it occurs in winter, rather than in summer, a season unfavorable to the growth of organisms on exposed parts. During the past winter microscopic examinations of scrapings from several of the cases have been made, using ether to dissolve out the fat and a 10 per cent. potassium hydrate solution as clearing agent. In no case has any organism allied to the *tinea* group been found. Gram stains of the tissues in the latter stages of the disease have shown numerous gram positive skin cocci; but these, of course, are merely secondary invaders.

Having eliminated saprophytic organisms as a causative factor the influence of weather may be considered. Careful examination of the weather statistics for the last ten years shows that around the Great Lakes extreme daily variations in the thermometer are not any greater than in other parts of the country, for example, the inland cities of Cincinnati, Ohio, and Columbia, Missouri.

However, the weather is very variable, as may be easily shown. The average of the United States weather statistics for the last ten years shows that at Buffalo during the month of January, 14 per cent. of the days were rainy and 60 per cent. with snow, while 9 per cent. were foggy. There were also gales during 12 per cent. of the days and calms during 3 per cent. Cleveland during the same month had 13 per cent. of rainy days, 39 per cent. of snow, 4 per cent. of fogs, 9 per cent. of gales, and 6 per cent. of calms. During the month of March, averaged for ten years, Chicago had 24 per cent. of days with rain and a like percentage with snow, while 12 per cent. were foggy, 6 per cent. with gales, and 3 per cent. with calms. Buffalo during the same month had 22 per cent. of rainy days, 36 per cent. of snow, 15 per cent. of days with fog, 8 per cent. with gales, and 7 per cent. with calms. In Cleveland during the month of February the average for ten years shows the following: 13 per cent. of the days were rainy, 46 per cent. were accompanied with snowfall, 7 per cent. with fogs, 10 per cent. with gales, and 2 per cent. were calm days. These figures demonstrate the extreme variability of the winter weather about the Great Lakes.

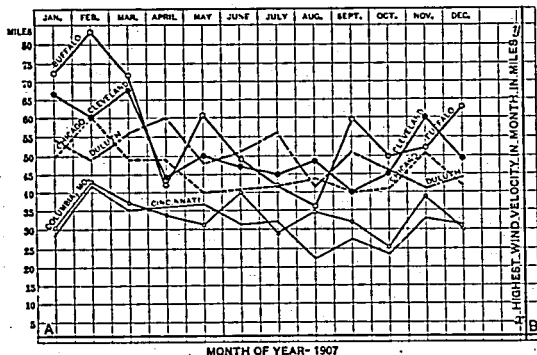


FIG. 1.—Highest velocity of wind in miles per hour.

In addition, this region is visited, especially during the winter months, with high winds. Examination of Fig. 1, taken from the report of the United States Weather Bureau for the year 1907, shows the highest velocity of the wind in miles per hour during the respective months, the lake cities, Buffalo, Chicago, Cleveland, and Duluth, being compared to the inland cities of Cincinnati, Ohio, and Columbia, Missouri.

It may be noted that the winds around the Great Lakes are especially high during the winter months and become somewhat lower during the months of June, July, August, and September. And not only are the winds of higher velocity in miles per hour, but examination of Fig. 2 will demonstrate that the total wind movement in miles per month is much greater in the cities of the Great Lake region than in the inland cities.

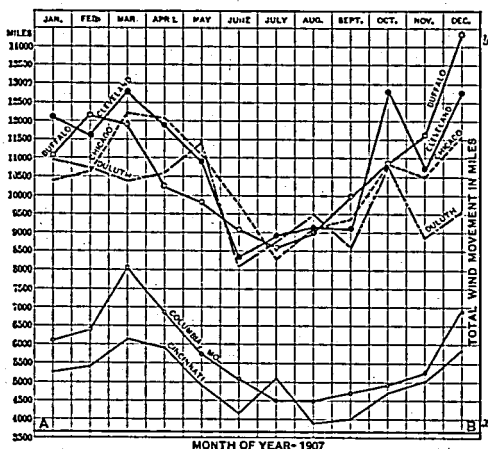


FIG. 2.—Total wind movement in miles per month.

To summarize, the winter climate around the Great Lakes, though not showing extreme changes in temperature in twenty-four hours, is very variable, especially in conjunction with the winds of high velocity and of high wind movement in miles per month.

CASE HISTORIES.

CASE I.—Female, aged twenty-three years; occupation housework. Aside from the present trouble the patient has always been well and strong. About two weeks before admission she first began to notice an itching, burning eruption which broke out on the back of one hand. Since then it has bothered her a great deal, and she has noticed a moist exudate at times. At the time of writing there is an area about 2 x 2 cm. on the back of the left hand, and a smaller one on the right wrist. Both areas are circinate, well defined, with

slightly elevated edges, and a tendency to heal in their centres. As yet there is very little crust formation, but one sees some cracking of the surfaces and a little serous exudate. The areas are of a dark red color and show no induration. Patient says none in the family are troubled with a like affection, and she has never had it before.

CASE II.—George S., aged twenty-one years; switchman. The family and personal histories are negative. Patient had an infection of the second finger of the right hand three years ago, and ever since there has been a scaling and cracking of the skin over this area. About three months before admission an eruption broke out at the base of the third finger of the left hand and the like finger of the right. The lesions have extended a little, and a month later another lesion appeared on his right forearm. Patient was admitted to Lakeside Hospital for study. The blood showed at that time 3 per cent. of eosinophiles, otherwise nothing out of the ordinary was found. The lesions were similar to those of Case I except that there was crust formation and more induration of the areas. A biopsy was made of several fresh papules found on the affected area of the forearm. The finger involved for three years showed merely a chronic eczema, illustrating the fact that an eczema and a dermatitis hiemalis may be present on the same patient.

CASE III.—Carl W., aged thirty years; baker. Patient is a Bohemian, and was never troubled with this disease until last year, when he came to this country and settled in Detroit. The disease was present all winter, disappearing the summer following, only to appear again the next October. Patient came to Cleveland, hoping to be relieved of the trouble, but he has been troubled off and on for the last five months. The eruption itches and burns a great deal, and there is more or less of a moist exudation. The areas bleed quite easily; otherwise he feels perfectly well. Both posterior surfaces of the hands and one wrist are affected with well-defined, circinate, dark red lesions, showing an elevated edge and a noticeable tendency to heal in their centres. Crust formation is quite marked, and there is some induration of the parts. A biopsy was made of an area about three or four weeks old, and also from a spot of more recent appearance.

CASE IV.—G. W. P., aged thirty-five years; bookkeeper. His habits are good, and he has always been well, except for the present trouble. For the last ten years the patient has been bothered every year with an itching, burning eruption, which is limited to the hands, and is present only during the winter. It appears early or late in the fall, according to the severity of the weather, as he has himself noticed, and lasts until spring. At times the lesions will partially heal, but only to reappear, and he has never found anything that gave him much relief. He says he has never changed climate during the winter, so does not know what effect another climate would have on the condition. No others of the family are

troubled. The lesions on the back of the hands are quite extensive, but always well defined, and with a marked tendency to heal in the centre. The skin is quite thick, and there appears to be an hypertrophy of the upper layers. A biopsy was made of two areas of several months' duration.

It might be said that all the patients mentioned returned at more or less regular intervals during the winter. Their lesions would partially heal up at times, only to reappear, despite treatment. However, with the return of spring all of them immediately began to improve, and with the exception of Case III, all were well by the last of May. Case III reported himself well the middle of June.



FIG. 3.—Early lesion. $\times 140$. Bursting of a superficial vesicle, with marked edema and infiltration of the papillae and epidermis with leukocytes.

A STUDY OF THE HISTOLOGICAL FINDINGS. A. Early Lesion. The lesion was taken from Case I. In the area of the section showing the least change from the normal (Fig. 3) we find the stratum corneum about 4 to 5 cells thick, in which the individual cells are made out with difficulty and most of the nuclei not at all. There is a stratum lucidum 1 or 2 cells thick in which the nuclei are absent and the cells are filled with fine granules. The stratum granulosum is 4 to 6 cells in depth and the cells show shrunken, hyperchromatic nuclei and masses of extruded chromatin in their protoplasm. The stratum spinosum under this is about 13 cells in thickness over the papillae and 24 in the interpapillary processes of the epidermis. These cells are normal in appearance. The papillae under this area show merely enlarged vessels with swollen endothelial cells and a slight perivascular edema. There is no perivascular cellular exudate.

A short distance from the area already described we come to a field where further changes have taken place (Fig. 8). Here the stratum corneum (a), about 5 cells thick, is made up of compressed, coherent cells; still containing their shrunken hyperchromatic



FIG. 4.—Moderately early lesion. $\times 120$. Vesicle deep in the epidermis, with superficial crust formation. Stratum spinosum swollen and hypertrophied.



FIG. 5.—Height of process. $\times 70$. Superficial crust formation and papillary vessel greatly dilated. Epidermis shows edema, acanthosis, and infiltration, with leukocytes.

nuclei. Intercellular spaces are seen between the lamellæ, probably filled with more or less fluid. The stratum lucidum (b) is scarcely discernible, and the stratum granulosum (c), 2 to 3 or 4 cells thick at one end of the figure, has nearly disappeared at the other end.

Still further changes are shown in Fig. 9, where neither the stratum granulosum nor lucidum are to be made out, and numerous small vacuolated areas are found under the lamellæ of the corneum. The latter, here 4 or 5 cells in thickness, still retains its nuclei and appears moderately lamellated. The prickle cell layer under this is from 13 cells in thickness over the papillæ to 28 cells in the inter-papillary epidermis. The cells of the stratum spinosum over the papillæ are very much separated by edema, and about the middle of the stratum there is an area where the strain on the intercellular bridges has finally become so marked that they have broken, resulting in a vesicle formation, containing a few polymorphonuclear leukocytes, shrunken cells, and nuclei (Fig. 10). Deeper in

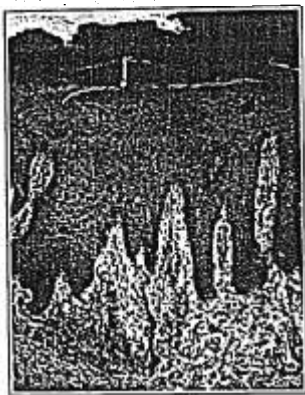


FIG. 6.—Chronic process. $\times 70$. Intense parakeratosis and scanty cells. Marked leukocytic infiltration around the vessels of the corium.

the epidermis, between the papillæ, the edema is not so marked, and the cells are merely more or less separated. The edema is mostly extracellular in type. The papillæ in the region are very edematous, the vessels are enlarged, and their endothelial cells swollen, while there is an exudate of cells and fluid which have extended, not only into the papillary tissue, but also outward between the cells of the nearby stratum spinosum. The cellular exudate is mostly polymorphonuclear, with a few small mononuclears; indicating an acute process. The deep corium reveals little outside of a like condition around the vessels. There is no change in the collagen or elastic fibers.

B. More Advanced Lesion. This section was removed from an old lesion on the arm of Case II, as a few new papules had formed on it. Only the fresh lesion will be described.

At about the centre of the section (Fig. 4) there is quite a perceptible elevation of the epidermis. One notices at once the heavy edema and cellular exudate in the immediate vicinity. The stratum corneum consists of only 2 or 3 strands of flattened, nucleated cells which have been forced apart, as it were, by some pressure from below. Beneath them there is an open area dipping down into the epidermis, which contains mostly red blood cells, coagulated fibrin, and a few fragments of broken down epidermic cells. From this ruptured vesicle definite intercellular spaces lead down to the edematous papilla, although the spaces are clogged with an exudate



FIG. 7.—Healing process. X 70. Old crust on new-formed normal stratum corneum. Acanthosis of epidermis. Infiltration and thickening of vessels of corium.

of leukocytes and red blood cells. There is no stratum granulosum or lucidum and the stratum spinosum is about 8 cells thick over the papillae and 16 to 18 cells thick over the interpapillary spaces. There is a marked general extracellular edema of the stratum spinosum, very few mitoses are seen, and the deeply staining nuclei are somewhat shrunken from their cell boundaries.

Corium: The papillae in the area involved show enlarged vessels, with swollen endothelial cells. There is a marked edema of the perivascular tissue and a cellular exudation, mostly of polymorphonuclear leukocytes and red blood cells. The collagen fibers are swollen and stain poorly, while the nuclei are few and compressed. Elastic fibers are very fine. The vessels in the deeper corium will not be described at this time as they show the same results as observed in the older processes.

C. *Intermediate Stage.* In a stage slightly more advanced than the last, found in a section of tissue from a patient suffering from this particular lesion for two weeks, the following is noted: At one end of the section there is a large crust replacing the stratum corneum, and even thicker than the epidermis, being made up of coagulated fibrin, broken-down cells and nuclei, red blood cells, and numerous large gram positive skin cocci. Here and there one or two cells with shrunken nuclei and a partial extrusion of chromatin show us what should be the stratum granulosum. The stratum lucidum is absent. The stratum spinosum is about 12 cells thick over the papillae and about 18 cells in thickness in the interpapillary epidermis. It gives one the impression of being swollen, which is accounted for by the marked intercellular edema,

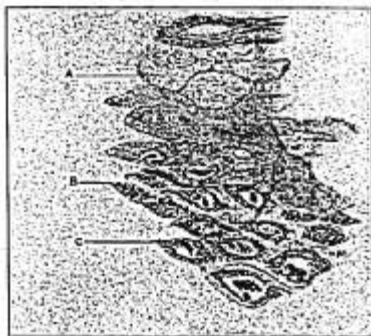


FIG. 8.—Earliest lesion, showing normal process of cornification. Superficial area of middle of the epidermis of same section as in Fig. 3. A, stratum corneum; B, stratum lucidum; C, stratum granulosum. All drawings—Figs. 8 to 12—were made with a Spencer camera lucida, Leitz 4 ocular and Leitz 12 objective, giving a uniform magnification of 1575 diameters.

while at one area there is a deep vesicle formation, in which coagulated fibrin, broken down cells, nuclei, and red blood cells are seen. Some of the red cells are noticed to have travelled out between the intercellular spaces of the stratum spinosum, the cells of which appear to be larger and better nourished than normally. Numerous mitotic figures are seen and several amitotic divisions are observed (Fig. 11), a very unusual condition, indicating the rapid multiplication of the cells. The vessels supplying this portion of the section are dilated, giving indication of a large vascular supply to the part. In addition to the changes already described in the previous sections a larger proportion of small mononuclear cells are present in the perivascular exudate, indicating a beginning chronic process of inflammation. At this stage the collagen fibers are beginning to

stain poorly, and they are forced apart by the edema of the tissues. No nerve tissue is observed.

D. Height of the Process. This is shown in a section of tissue from the same patient, but it exhibits a more marked change. It was removed from the posterior surface of the left hand.



FIG. 9.—Earliest lesion, to show absence of stratum granulosum stratum luidicum. *A*, inter-lamellar vesicle formation; *B*, slightly hyperchromatic, persistent nuclei of lamellated stratum corneum; *C*, persistent stratum spinosum.

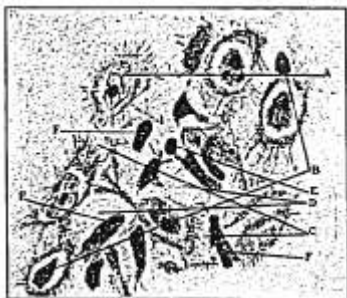


FIG. 10.—Early lesion. Superficial vesicle of prickle-cell layer below Fig. 4. *A*, normal prickle cell; *B*, shrunken nuclei of cells with intracellular edema; *C*, extracellular edema; *D*, vesicle formation; *E*, lymphocyte; *F*, shrunken nuclei.

On examination with the low power one is immediately struck by the heavy vascular supply of the parts (Fig. 5). A large crust extending nearly the entire distance across the section is made up of the same elements as the crust already described. There is no

stratum granulosum or stratum lucidum, but rather vacuolated areas filled with fibrin and more or less cellular exudate. Definite intercellular spaces lead down through the edematous prickle-cell layer to the very edematous, injected papillae. These spaces are clogged with red blood cells and polymorphonuclear and small mononuclear leukocytes. The stratum spinosum is 6 to 8 cells thick over the papillae and from 35 to 40 cells in thickness in the interpapillary epidermis. It is made up of large swollen cells showing numerous mitoses, the cells being separated more or less by edema. However, the edematous condition is more marked above the papillae. These have an intense vascular supply and a perivascular edema that has entirely separated the tissues. The latter shows a very large cellular infiltration. The vessels in the deeper corium show a like condition, and there is a slight thickening of their walls, now and then a young fibroblast being seen. The collagen and elastic fibers show no changes not already described. No nerve tissue is seen.

E. First Stage of the End Process. This section to be described was removed from a chronic hypertrophied area from the hand of Case IV.

Examination even with a low-power lens shows a marked thickening of the stratum corneum and a great depth to the interpapillary epidermal processes. Near the centre of the section the following condition is observed: There is a stratum corneum (Fig. 6) about 40 to 45 cells in thickness, made up of flattened, incompletely dried-out cells in which the shrunken, hyperchromatic nuclei are still present. The stratum spinosum is about 35 to 40 cells thick between the papillae and 10 to 12 cells thick over them. A layer of 2 or 3 cells showing a defective extrusion of chromatin from their shrunken nuclei gives evidence of a beginning formation of the stratum granulosum. There is no edema of the epidermis and no infiltration with cells. A few mitoses are seen, indicating a slightly increased nutrition of the part. The corium shows nearly the same condition as in the former section, and the type of cellular exudate around a papillary vessel is shown in Fig. 12. But at this stage the vascular supply is not so extensive and the vessel walls show some thickening, occasionally a young fibroblast being seen.

F. Final Stage of the End Process. This section is from an area on the hand of Case IV, and is of several months' duration (Fig. 7).

There is a stratum corneum about 12 cells thick, in which the outlines of the cells can still be made out, though with difficulty, and the nuclei exist only as empty spaces, having lost all their chromatin. Near the centre of the section there is a large dense crust, as thick as the horny layer, and superimposed upon it. There is a nearly normal stratum granulosum 3 or 4 cells thick and a stratum lucidum 1 or 2 cells in thickness. The prickle-cell

layers shows a definite acanthosis from the long-increased blood supply, and is about 15 cells in thickness over the papillæ; and from 30 to 32 cells thick between them. There is very little intercellular edema and none intracellular. The cells are large, and appear to be well supplied with nourishment, and one amitotic



FIG. 11.—Moderately early condition, from portion of same area as Fig. 4, and showing cell division by amitosis. A, beginning vacuolar degeneration.

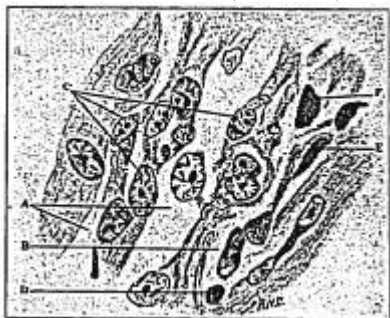


FIG. 12.—Chronic process. Portion of middle of papillæ from same area as Fig. 6. A, dilated vesicles; B, perivascular edema; C, swollen endothelial cells; D, lymphocyte; E, shrunk nucleus; F, large mononuclear cell.

division is observed. The vessels of the papillæ are still moderately dilated and have swollen endothelial cells. Still there is very little exudation of serum and only a few perivascular elements, mostly small mononuclears and young fibroblasts. The collagen fibers of the corium are still swollen and forced apart, but they are beginning to stain more readily. The elastic fibers are fine and not

forced apart so much as in previous sections. No nerve elements are seen. The vessels of the corium show thickened walls and swollen endothelial cells lining them, while a few young fibroblasts are seen in the walls. Their intense perivascular exudate is mostly small mononuclear cells and a few young fibroblasts; now and then an eosinophile is seen.

PRODUCTION OF THE CONDITIONS OF PARAKERATOSIS AND ACANTHOSIS. Before taking up the study of the course of events in the different stages of this condition it may be well to review the subjects of parakeratosis and acanthosis somewhat in detail, especially as they have an important bearing on the findings of this condition in its different stages. As already emphasized by Corlett and Schultz,³ "cornification is not a process of specialization and differentiation but of gradually progressing physiological degeneration, which leads ultimately to death." Apparently the only functions preserved by the epidermal cells are nutrition and multiplication, and as they get further from their papillary blood supply they lose first their power of multiplication and later that of nutrition. The cells then begin to dry up and their nuclei shrink and become hyperchromatic. This nuclear chromatic material is then partially extruded from the nucleus, from disturbance of the cell-nucleus balance, resulting in the coarsely granular cells of the stratum granulosum. Later it is entirely extruded and finely distributed through the protoplasm, while the nucleus disappears entirely, cells of the stratum lucidum type. In the final death of the cell the chromatin disappears entirely and the cells of the stratum corneum are mere dried up, horny lamellæ.

However, if there is an edema of the tissues with resulting increased nutrition of the epidermal cells, we will find a disturbance in the process of cornification. The cells not only are able to multiply for a longer period than normally, but they retain the power to assimilate nutrition and fluid. Consequently, they do not become dried up until they reach the surface, so that no cells of the stratum granulosum or stratum lucidum type are formed. At the surface the rapid, only partial drying-out process results in the formation of nucleated, horny lamellæ. All variations between this condition of parakeratosis and the normal may be found, depending on the degree of edema of the parts.

The phenomena of acanthosis are likewise dependent in part on the increased nutrition of the cells. As Unna⁴ has already pointed out, in the normal epidermis from one-fourth to one-third of the epidermal mitoses takes place in a middle zone of the stratum spinosum and from two-thirds to three-fourths in the two lower layers of cells of the epidermis. But in a condition of edema where

³ Jour. Cutan. Dis., February, 1909.

⁴ Die Histopathologie der Hautkrankheiten, Berlin, 1894, s. 201.

all the cells are bathed in an increased nutritious serum, they retain their multiplicative and assimilative capacities longer than usual, and we find many mitoses, even but a few cells deep from the external surface. Consequently, more cells are formed, they are larger, and live longer than normally. Hence the epidermis is thickened, and is found not only to extend further upward, but the inter-papillary processes even extend deeper into the corium, and we have acanthosis.

THE CHANGES OBSERVED IN THE PRODUCTION OF THE LESIONS. We are now ready to explain the course of events in the production of the lesions. Given a susceptible person the variable, wintry, windy weather, as met with in the Great Lake region of North America causes an irritation of the skin of the hands, resulting first in a slight vascular dilatation of the vessels of the papillæ. The endothelial cells lining the vessels swell up, and if the condition continues there will result the extravasation of some serum from these vessels into the papillary tissue. Possibly a few polymorphonuclear leukocytes will also find their way into the surrounding tissues. The irritation still continuing, there will be a constantly increasing vascular dilatation, and a larger amount of serum being poured out, it will gradually work out through the lymph channels of the epidermis, resulting in a higher or lower grade of edema. And, as has been shown, even a slight grade of edema will exercise quite a marked influence on the process of cornification, resulting in a parakeratosis. The process of exudation of the serum from the papillary capillaries, with the passage out of leukocytes and red blood cells, may be very rapid in its course. Then this exudate, working out from the papillæ, through the lymph channels into the epidermis, may cause such a sudden strain on the intercellular bridges of the prickle cells that they are no longer able to withstand, and they burst. Such a condition we find in Fig. 10, when the vesicle is deep in the stratum spinosum. However, suppose the edematous area is situated high up in the epidermis and that the area is covered only by a few layers of rapidly and incompletely cornified cells. Then when the pressure becomes too great the vesicle may break outward and we find such a picture as is shown in Fig. 3, the vesicle containing fibrin, broken-down leukocytes, and red blood cells. Such an exposed area is soon changed into a crust of coagulated serum, broken-down epithelium, nuclei, red cells, and leukocytes. This is the height of the process, and at this time we almost invariably find a secondary growth of Gram-positive skin cocci in the crust. There are also more or less changes in the deep corium, due to the etiological factor before mentioned, in connection with the irritation of broken-down cellular products, etc. Here, too, the vessels become dilated, the endothelial cells swollen, and an exudate of serum and polymorphonuclear cells is poured out into the surrounding tissues, resulting

in a perivascular edema and inflammation. Indeed, the perivascular edema may be so marked at this time that the tissues are entirely forced apart and broken up.

Again, suppose the irritation has continued for some time, then we will find an even more severe type of change around the vessels of the corium. There is a heavy exudate of serum and leukocytes, the latter mostly small in type, with an occasional eosinophile and endothelial cell. The collagen fibers are swollen, forced apart, and stain poorly, while their nuclei are flattened from the pressure of serum in the tissues. The elastic fibers are also forced apart. The result of the copious supply of serum from the papillary vessels to the epidermis is that the cells receive better nutrition than normal, so that they are continually bathed in serum. Instead of drying up they will continue to assimilate nutrition and to multiply, both by direct and indirect division. The result is the production of a thickened epidermis, showing an atypical process of cornification, parakeratosis. Moreover, examination shows us long interpapillary processes of epidermis made up of large, healthy looking cells, showing numerous mitoses and apparently growing down into the corium as well as upward, acanthosis. This is the intermediate step between the acute and the chronic process as shown in Fig. 6. Crusts may or may not be present.

As the chronic stage begins to appear we find certain vascular changes that have a very important bearing. From the long-continued irritation we not only have the perivascular exudate already spoken of, but, as in Fig. 12, the vessel walls become thickened and a few young fibroblasts are seen in the walls and in the surrounding tissues. This thickening of the vessel walls tends to reduce the blood supply and consequently the edema, so that once more we have a return of the tissues to the normal, from the decreased vascular supply. Such a condition is shown in Fig. 7, where a thickened, evidently long-irritated epidermis is shown undergoing a normal process of cornification, though it still retains a crust above it, revealing an old process as yet incomplete.

Either the healing takes place through a process of chronic inflammation, as outlined above, or at the approach of spring the changeable, windy weather no longer irritates the susceptible parts, so that even though the process be acute, by removing the causative factor the condition tends to subside from lessened blood supply, and thus a return to the normal is found.

TREATMENT. Of this little need be said, as no treatment seems to have much effect, at least not for any length of time. The general hygienic care of the skin should be enjoined, together with such protective measures as the wearing of leather gloves, etc. No special internal medication has been found of any avail. Locally, diachylon ointment with salicylic acid, varying in strength from 3 to 10 grains to the ounce, may be used, often with good results for

the time being. At times, Lassar's paste seems to work well, while the boric acid ointment (U. S. P.) or the white precipitate ointment, 5 per cent., may be used. As a prophylactic to those predisposed simple protective applications of petrolatum and paraffine are indicated on the approach of cold weather. In all cases the patient should be cautioned to keep the hands out of water as much as possible, and to avoid all local irritants. The ideal treatment to be advised is a change of climate to a warmer region, a treatment always followed with a disappearance of the trouble.

In conclusion we wish to thank Dr. O. T. Schultz, of the Pathological Department of the Western Reserve University, for his valuable assistance and suggestions in the histological study of this paper. To him also thanks are due for the taking of the photomicrographs.

EXPERIMENTAL STUDY OF THE EFFECTS OF URETERAL OBSTRUCTION ON KIDNEY FUNCTION AND STRUCTURE.¹

By EDWIN BEER, M.D.,

NEW YORK CITY.

THE following work was begun over four years ago, to determine, if possible, how long a ureter might be tied off, before making an ureterovesical anastomosis, without sacrificing the involved kidney's functional integrity. In the course of difficult pelvic dissections it is well known that the ureters are occasionally injured and at times the attempt to repair the damage protracts the original operation to a dangerous degree. To avoid this prolongation, numerous operators have resorted to direct ligation of the involved ureter² above the point of injury, relying upon the natural process of atrophy to take care of the thus excluded kidney. If an operator is thus forced to exclude the kidney of one side, either actuated by such doubts as are engendered by undue prolongation of the operation, or by reason of the fact that the operative technique appears to be too difficult, the possibility of a later operation anastomosing the excluded side with the bladder has been completely ignored, so far as I have been able to discover in a study of the literature. To determine how long such a kidney could wait without losing its functional adequacy was the original impulse for this study, in the course of which many other interesting points developed. In this paper I expect, therefore, as briefly as possible,

¹ Read before the Surgical Section of the New York Academy of Medicine, 1912.

² L. Landau, *Deut. med. Woch.*, 1900; Wassiljew, *Deut. Zeit. f. Chirurgie*, 1907, lxxix; A. V. Roethorn, *Jour. Amer. Med. Assoc.*, 1906, p. 1881.